



IEC PAS 63312

Edition 1.0 2021-01

PUBLICLY AVAILABLE SPECIFICATION

PRE-STANDARD



Technical specification for flame detector system of boiler

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 27.060

ISBN 978-2-8322-9241-9

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD	5
INTRODUCTION	7
1 Scope	8
2 Normative references	8
3 Terms and definitions	9
4 General	12
4.1 General requirements	12
4.2 Power supply	12
4.3 Functions and performance of flame detector	12
4.4 Signal output	13
4.5 Interchangeability	13
4.6 Installation	13
4.7 Commissioning	13
4.8 Inspection and maintenance	13
4.9 Tests	14
5 Classification and requirements (design)	14
5.1 Classification of flame detectors	14
5.1.1 Classification principle	14
5.1.2 Classification according to detection principle	14
5.1.3 Classification according to the structure of flame detector	15
5.1.4 Classification according to installation method	15
5.1.5 Classification according to safety level	15
5.2 Technical requirements of flame detectors	15
5.2.1 Basic functional requirements	15
5.2.2 Basic performance requirements	17
5.2.3 Reliability requirements	18
5.3 Technical requirements of cooling system (optional, depending upon the actual requirements of flame detectors)	20
5.3.1 Functional requirements of cooling air system	20
5.3.2 Performance requirements of cooling air system	21
6 Installation and commissioning requirements	22
6.1 System installation requirements	22
6.1.1 Installation preparations	22
6.1.2 Installation of flame detectors	23
6.1.3 Acceptance of installation	26
6.2 Commissioning requirements after installation	27
6.2.1 Static commissioning	27
6.2.2 Dynamic commissioning	29
6.2.3 Contents of system dynamic commissioning	29
6.2.4 Acceptance of system commissioning	31
7 Requirements on inspection, operation and maintenance	32
7.1 System inspection and maintenance requirements	32
7.1.1 Preparations	32
7.1.2 Power supply inspection	33
7.1.3 Installation inspection of flame detectors	33
7.1.4 Dismantlement and inspection of optical fibers	33

7.1.5	Inspection and maintenance of analysis and processing unit	34
7.1.6	Inspection and maintenance of cables	35
7.1.7	Inspection and maintenance of cooling air system	35
7.2	System test requirements	36
7.2.1	Power system test	36
7.2.2	Inspection on the analysis and processing unit	36
7.2.3	Inspection and tests on flame detector probes	36
7.2.4	Basic functional tests	37
7.2.5	Parameter adjustment test	37
7.2.6	Check of parameter settings	37
7.2.7	Tests on cooling fans	37
7.3	System operation	38
7.3.1	Restart	38
7.3.2	Maintenance during operation	38
7.3.3	Inspections before boiler shutdown	39
7.4	System maintenance requirements	39
7.4.1	Routine maintenance	39
7.4.2	Regular maintenance	39
7.5	Archives	40
8	Test methods and requirements	41
8.1	Test methods	41
8.1.1	General	41
8.1.2	Test reference conditions	41
8.1.3	Test instruments and equipment	41
8.1.4	Test items and methods	42
8.2	Equipment factory acceptance test	44
8.2.1	Test items	44
8.2.2	Judgment of eligibility	44
8.3	Type test	44
8.3.1	General	44
8.3.2	Situations requiring type test	44
8.3.3	Sampling principles	44
8.3.4	Judgment of eligibility in type test	45
Annex A (informative)	Composition of flame detector system	46
A.1	General	46
A.2	Flame detector	46
A.3	Signal transmission components and cables	47
A.4	Analysis and engineering tools	47
A.5	Power system	47
A.6	Cooling air system (optical, depending on design requirements)	47
Annex B (informative)	Marking, packaging, transportation and storage of flame detectors	48
B.1	Marking	48
B.2	Packaging	48
B.3	Transportation	48
B.4	Storage	48

Figure A.1 – Schematic diagram of a typical light signal-based flame probe.....	46
Figure A.2 – Schematic diagram of an imaging-based flame detector probe.....	46
Table 1 – Configuration of monitoring and interlocking instruments of flame detector cooling air system	20
Table 2 – Installation acceptance criteria of flame detector system	26
Table 3 – Commissioning acceptance items of flame detector system.....	32
Table 4 – Test instruments and equipment.....	41
Table 5 – Requirements on insulation resistance tester	42

INTERNATIONAL ELECTROTECHNICAL COMMISSION

TECHNICAL SPECIFICATION FOR FLAME DETECTOR SYSTEM OF BOILER

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

A PAS is an intermediate specification made available to the public and needing a lower level of consensus than an International Standard to be approved by vote (simple majority).

IEC PAS 63312 has been processed by subcommittee 65B: Measurement and control devices, of IEC technical committee 65: Industrial-process measurement, control and automation.

The text of this PAS is based on the
following document:

This PAS was approved for
publication by the P-members of the
committee concerned as indicated in
the following document

Draft PAS	Report on voting
65B/1175/DPAS	65B/1180/RVDPAS

Following publication of this PAS, which is a pre-standard publication, the technical committee or subcommittee concerned may transform it into an International Standard.

This PAS shall remain valid for an initial maximum period of 2 years starting from the publication date. The validity may be extended for a single period up to a maximum of 2 years, at the end of which it shall be published as another type of normative document, or shall be withdrawn.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

The flame detector is the key testing equipment for the boiler furnace safety protection and burner interlock control. In the whole combustion process of the boiler (especially in the variable operating condition), it detects the change of the combustion condition, and the corresponding control measures are taken through the connected terminal devices; so its reliability is related to the safety of the combustion system and the quality of the terminal products. Due to the difference in combustion conditions in the furnace, the reliability of the flame detector itself and the quality of the installation and maintenance, many problems are exposed during the operation, such as peeping of fire detection signals, missed detection, instability, false alarm information, fiber overheating loss, etc. All of these will bring safety hazards to the industrial production.

The purpose of this PAS is to develop comprehensive technical specifications for the functions and performance of industrial boiler flame detectors, as well as the technical requirements related to design, manufacture, installation, testing, operation, maintenance, etc., so as to provide the technical basis for flame detector system users.

TECHNICAL SPECIFICATION FOR FLAME DETECTOR SYSTEM OF BOILER

1 Scope

This PAS deals with the general requirements, classification and technical requirements, installation and commissioning requirements, inspection and maintenance requirements, test methods and requirements of radiant energy sensing flame detectors (including IR, UV, visible light, and imaging-based flame detectors).

This PAS is applicable to the type selection, design, installation, commissioning, inspection, maintenance and acceptance of the radiant energy sensing flame detectors, which monitor the flame status of burners.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60034-30-1, *Rotating electrical machines – Part 30-1: Efficiency classes of line operated AC motors (IE code)*

IEC 60068-2-1, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-27, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-78, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*

IEC 60079-1, *Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures "d"*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 61010-1, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements*

IEC 61326-1, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements*

IEC 61326-2-5, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-5: Particular requirements – Test configurations, operational conditions and performance criteria for field devices with field bus interfaces according to IEC 61784-1*

NFPA 85, *Boiler and Combustion Systems Hazards Code*

ANSI/TIA/EIA-232-F, *Interface between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange*

ANSI/TIA/EIA-422-B, *Electrical Characteristics of Balance Voltage Digital Interface Circuits*

ANSI/TIA/EIA-644-A, *Electrical Characteristics of Low Voltage Differential Signaling (LVDS) Interface Circuits*